CLAIMS

1. A system for capturing an image of a retina of an eye for identification comprising:

a source of illumination light;

a lens through which the illumination light passes to illuminate the retina, the lens receiving light reflected from the retina;

an image signal generator responsive to light reflected from the retina to generate a signal representing an image of an illuminated area of the retina; and

an alignment system including an ultrasound transducer, the system being responsive to the transducer to determine when the eye is a predetermined distance from the image capturing system and providing an indication to the user when the eye is at the predetermined distance.

2. A system for capturing an image of a retina of an eye for identification as recited in claim 1 wherein the alignment system includes an elongated channel having an end into which a user looks, the longitudinal axis of the channel being at an angle with respect to a centerline of the lens and an object being disposed in the channel at a distance from the end into which the user looks wherein the object is viewable when the eye is aligned along the longitudinal axis.

3. A system for capturing an image of a retina of an eye for identification as recited in claim 2 wherein said object is a light.

4. A system for capturing an image of a retina of an eye for identification as recited in claim 2 wherein the object is a light, the light is flashing when the eye is not at the predetermined distance, the flashing rate of the light changing as the distance of the eye approaches

the predetermined distance and the flashing stopping when the eye is at the predetermined distance.

5. A system for capturing an image of a retina of an eye for identification as recited in claim 2 wherein the object is a light and the aspect ratio of the diameter of the channel at the location of the light to the length of the channel from the end into which the user looks to the location of the light is in a range of 0.02 to 0.084.

6. A system for capturing an image of a retina of an eye for identification as recited in claim 2 wherein the object is a light and the aspect ratio of the diameter of the channel at the location of the light to the length of the channel from the end into which the user looks to the light is approximately 0.04.

7. A system for capturing an image of a retina of an eye for identification as recited in claim 2 wherein the angle is such as to illuminate the optic disk to generate a signal representing an image thereof.

8. A system for capturing an image of a retina of an eye for identification as recited in claim 1 wherein said indication is visual.

9. A system for capturing an image of a retina of an eye for identification as recited in claim 1 wherein the said indication is audible.

10. A system for capturing an image of a retina of an eye for identification as recited in claim 1 wherein the illumination source is a non-scanned light source.

11. A system for capturing an image of a retina of an eye for identification as recited in claim 1 wherein the illumination source includes a green light and a red light.

12. A system for capturing an image of a retina of an eye for identification as recited in claim 11 wherein the lights are light emitting diodes.

13. A system for capturing an image of a retina of an eye for identification as recited in claim 1 wherein said lens has at least one rotationally symmetric aspheric surface.

14. A system for capturing an image of a retina of an eye for identification as recited in claim 1 wherein said image signal generator is a CCD camera.

15. A system for capturing an image of a retina of an eye for identification as recited in claim 1 including a pinhole lens disposed between the image signal generator and the lens.

16. A system for capturing an image of a retina of an eye for identification comprising:

a source of illumination light;

a lens through which the illumination light passes to illuminate the retina, the lens receiving light reflected from the retina;

an image signal generator responsive to light reflected from the retina to generate a signal representing an image of an illuminated area of the retina; and

an alignment system including a member with an elongated channel therein, the channel having an end into which a user looks and a

longitudinal axis at an angle with respect to a centerline of the lens, and an object disposed in the channel at a distance from the end into which the user looks wherein the object is viewable when the eye is aligned along the longitudinal axis.

17. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein said object is a light.

18. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein the object is a light, the light is flashing when the eye is not at the predetermined distance, the flashing rate of the light changing as the distance of the eye approaches the predetermined distance and the flashing stopping when the eye is at the predetermined distance.

19. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein the object is a light and the aspect ratio of the diameter of the channel at the location of the light to the length of the channel from the end into which the user looks to the location of the light is in a range of 0.02 to 0.084.

20. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein the object is a light and the aspect ratio of the diameter of the channel at the location of the light to the length of the channel from the end into which the user looks to the light is approximately 0.04.

21. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein the channel is a tubular channel with a black channel wall.

22. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein the alignment system determines when the eye is a predetermined distance from the image capturing system.

23. A system for capturing an image of a retina of an eye for identification as recited in claim 22 including an ultrasound transducer.

24. A system for capturing an image of a retina of an eye for identification as recited in claim 22 wherein the object is a light that is viewable when the eye is aligned along the longitudinal axis and the light has at least a first state and a second state, the light changing state when the eye is a predetermined distance from the image capturing system.

25. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein the illumination source is a non-scanned light source.

26. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein the illumination source includes a green light and a red light.

27. A system for capturing an image of a retina of an eye for identification as recited in claim 26 wherein the lights are light emitting diodes.

28. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein said lens has at least one rotationally symmetric aspheric surface.

29. A system for capturing an image of a retina of an eye for identification as recited in claim 16 wherein said image signal generator is a CCD camera.

30. A system for capturing an image of a retina of an eye for identification comprising:

a source of illumination light;

a lens through which the illumination light passes to illuminate the retina, the lens receiving light reflected from the retina;

an image signal generator responsive to light reflected from the retina to generate a signal representing an image of an illuminated area of the retina; and

an alignment system including:

an elongated channel having an end into which a user looks and a longitudinal axis at an angle with respect to a centerline of the lens;

a light disposed in the channel at a distance from the end into which a user looks so that the user's eye is aligned along the longitudinal axis when the light is visible, the light having at least a first state and a second state; and

a distance detector to determine when the eye is a predetermined distance from the image capturing system, the light changing state when the eye is at the predetermined distance.

31. A system for capturing an image of a retina of an eye for identification as recited in claim 30 wherein the light is flashing in one state and the light is continuously on in another state.

32. A system for capturing an image of a retina of an eye for identification as recited in claim 30 wherein the light is in a flashing state when the eye is not at the predetermined distance and the light is continuously on when the eye is at the predetermined distance.

33. A system for capturing an image of a retina of an eye for identification as recited in claim 32 wherein the flashing rate changes as the eye approaches the predetermined distance.

34. A system for capturing an image of a retina of an eye for identification as recited in claim 30 wherein the channel is a tubular channel with a black channel wall.

35. A system for capturing an image of a retina of an eye for identification as recited in claim 30 wherein the distance detector includes an ultrasound transducer.

36. A system for capturing an image of a retina of an eye for identification as recited in claim 30 wherein the ultrasound transducer is adjacent the channel.

37. A system for capturing an image of a retina of an eye for identification as recited in claim 30 wherein the object is a light and the aspect ratio of the diameter of the channel at the location of the light to the length of the channel from the end into which the user looks to the location of the light is in a range of 0.02 to 0.084.

38. A system for capturing an image of a retina of an eye for identification as recited in claim 30 wherein the object is a light and the aspect ratio of the diameter of the channel at the location of the light to

the length of the channel from the end into which the user looks to the light is approximately 0.04.

39. A system for capturing an image of a retina of an eye for identification as recited in claim 30 wherein the angle is such as to illuminate the optic disk to generate a signal representing an image thereof.

40. A system for capturing an image of a retina of an eye for identification comprising:

an illumination source including a red light emitting diode and a green light emitting diode, the light from the light emitting diodes being combined to illuminate the eye;

a lens through which light passes to illuminate the retina, the lens receiving light reflected from the retina; and

an image signal generator responsive to light reflected from the retina to generate a signal representing an image of an illuminated area of the retina.

41. A system for capturing an image of a retina of an eye for identification as recited in claim 40 including an alignment system to align the eye along a predetermined axis of the system and at a predetermined distance from the system.

42. A system for capturing an image of a retina of an eye for identification as recited in claim 40 wherein the lens has at least one aspheric surface defined by

$$Z=\frac{Cr^2}{1+\sqrt{1-(1+k)C^2r^2}}+A_1r^2+A_2r^4+A_3r^6.$$

43. A system for capturing an image of a retina of an eye for identification comprising:

an illumination source including at least one light emitting diode;

a lens through which light passes to illuminate the retina, the lens receiving light reflected from the retina and the lens having at least one rotationally symmetric aspheric surface; and

an image signal generator responsive to light reflected from the retina to generate a signal representing an image of an illuminated area of the retina.

44. A system for capturing an image of a retina of an eye for identification as recited in claim 43 wherein said aspheric surface is defined by

$$Z=\frac{Cr^2}{1+\sqrt{1-(1+k)C^2r^2}}+A_1r^2+A_2r^4+A_3r^6.$$

45. A system for capturing an image of a retina of an eye for identification as recited in claim 41 including an alignment system to align the eye along a predetermined axis of the system and at a predetermined distance from the system.

46. A method of capturing an image of an area of the retina of an eye for identification with a system having at least one light emitting diode, comprising:

directing light from the at least one light emitting diode to illuminate an area of the retina;

directing light from an illuminated area of the retina to a device for generating a signal representing an image of an illuminated area of the retina;

generating a fixation target viewable when an eye is generally aligned along an axis of the system; and

determining when an eye is at a predetermined distance from the system.

47. A method of capturing an image of an area of the retina of an eye for identification with a system having at least one light emitting diode, comprising:

directing light from the at least one light emitting diode to illuminate an area of the retina;

directing light form an illuminated area of the retina to a device for generating a signal representing an image of an illuminated area of the retina;

generating a fixation target viewable when an eye is generally aligned along an axis of the system;

determining when an eye is at a predetermined distance from the system; and

generating a signal representing an image of an illuminated area of the retina when the eye is determined to be at the predetermined distance.

48. A method of capturing an image of an area of the retina as recited in claim 47 wherein the light from the light emitting diode is directed to the retina after determining the eye is at the predetermined distance but before the image signal is generated.

49. A method of capturing an image of an area of the retina as recited in claim 47 wherein the light illuminating the retina includes red and green light.

50. A method of capturing an image of an area of the retina of an eye with a device comprising:

directing light from the at least one light emitting diode to illuminate an area of the retina;

directing light reflected from an illuminated area of the retina to an image signal generator that generates a signal representing an image of an illuminated area of the retina; and

generating at least one visual target to align the eye along a predetermined axis at a predetermined distance from the device.

51. A method of capturing an image of an area of the retina of an eye with a device comprising:

directing light from the at least one light emitting diode to illuminate an area of the retina;

directing light reflected from an illuminated area of the retina to a light responsive image signal generator;

generating at least one visual target to align the eye along a predetermined axis at a predetermined distance from the device;

determining alignment of the eye with the device; and

generating a signal representing an image of an illuminated area of the retina when the eye is aligned with the device.

52. A method of capturing an image of an area of the retina as recited in claim 51 wherein the light from the light emitting diode is directed to the retina after determining the eye is in alignment with the device but before the image signal is generated.

53. A method of capturing an image of an area of the retina of an eye for identification with a device comprising:

directing light from the at least one light emitting diode to illuminate an area of the retina;

directing light reflected from an illuminated area of the retina to an image signal generator;

generating at least one visual target to align the eye with the device;

determining alignment of the eye with the device; and

generating a signal representing an image of an illuminated area of the retina when the eye is aligned with the device.

54. A method of capturing an image of an area of the retina as recited in claim 53 wherein the light from the light emitting diode is directed to the retina after determining the eye is in alignment with the device but before the image signal is generated.

55. A method of capturing an image of an area of the retina of an eye for identification comprising:

simultaneously directing light from a green light emitting diode and a red light emitting diode to illuminate an area of a retina;

receiving light reflected from an illuminated area of the retina and directing the received light through at least one aspheric surface to a light responsive image signal generator; and

generating a signal representing an image of an illuminated area of the retina.